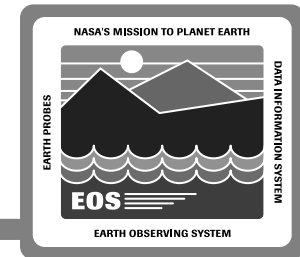


Data Management

Carol Lloyd

18 October 1995

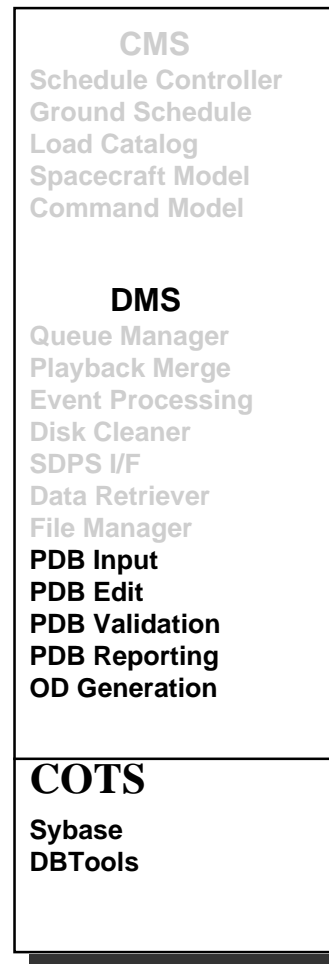
DMS Hardware Mapping



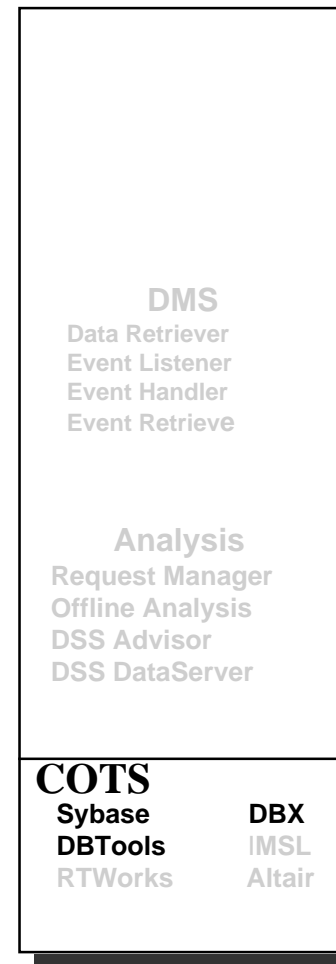
Real Time Server



Data Server



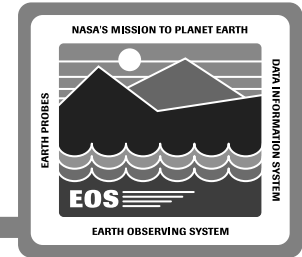
User Station



IST



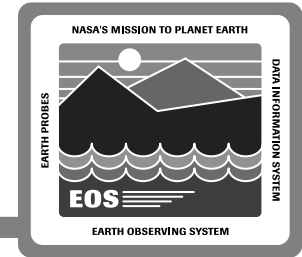
Data Management Overview



FOS Database
Database Features
Project Data Base (PDB)

Telemetry Archive
Event Processing
File Management

DMS Terminology

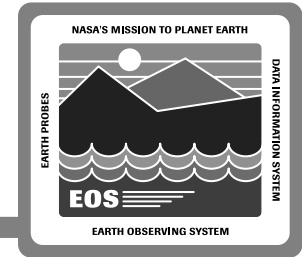


FOS Operational Data - a collection of data used to support operations at the EOC and managed by the FOS Data Management Subsystem (DMS); this data is stored in the database product, Sybase, or in a unix file

FOS Database - the name of the database application built on top of the database product Sybase; the PDB, metadata and the operational data tables are maintained within the FOS database

Project Data Base (PDB) - definition data stored as tables in the FOS database and used to support FOS operations

DMS Terminology (cont.)

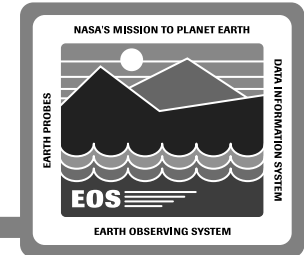


Metadata - information stored in the FOS database that is used to manage the operational data files accessed and maintained by the DMS

Operational Data Table (ODT) - data managed by the DMS which is stored in table format in the FOS database

Operational Data File (ODF) - data managed by the DMS which is stored as a file in unix format

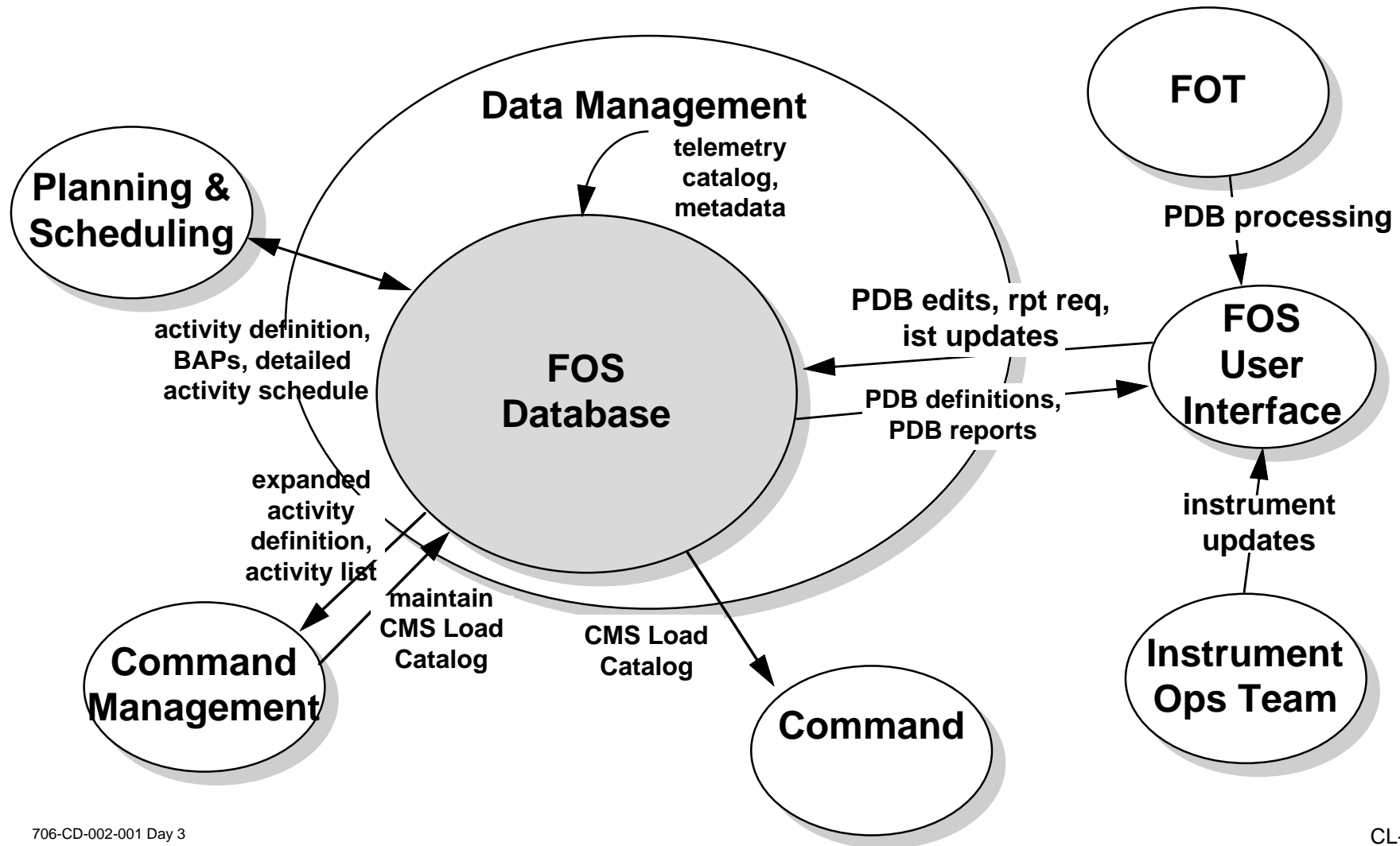
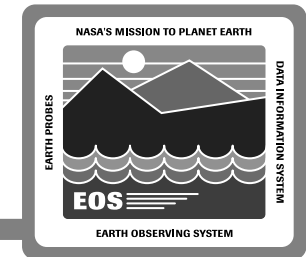
Operational Data Tables vs. Files



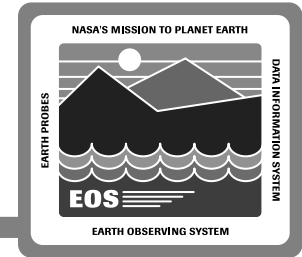
FOS Operational Data

Operational Data Tables (FOS Database)	Operational Data Files (Unix Files)
PDB Definitions - telemetry - command - constraint - activity Operational Command Tables Operational Constraint Tables Operational Activity Tables - definitions - BAP - detailed schedule CMS Load Catalog Tlm Catalog Metadata	Display Definitions Room Definitions ECL Procedures Telemetry ODF Command ODF Reports - PDB, CMS Event Archive Telemetry Archive Memory Dumps Ground Telemetry ODF Statistics Command Loads Ground Scripts Configuration Definitions Templates FDF Products Algorithms

FOS Database Context Diagram



Subsystem Users Of The FOS Database



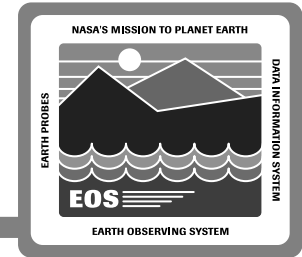
Identified Subsystem Users of the FOS Database

- Data Management
- Planning & Scheduling
- Command Management
- Command
- FOS User Interface

Criteria for database storage

- Data usage
 - frequent updates
- Data access
 - Single item or subset from data group
 - Data items from multiple sources of data
- Performance issues

FOS Database Schemas



Project Data Base (PDB)

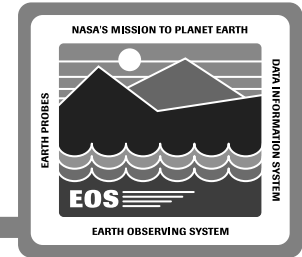
- Telemetry Definitions
- Command Definitions
- Activity Definitions
- Constraint Definitions (Activity, Command)

Metadata

Operational Data Tables (ODT)

- Command
- Activity
- Constraint
- Telemetry Catalog
- Baseline Activity Profiles (BAPs)
- Detailed Activity Schedule
- Spacecraft Activity Log
- CMS Load Catalog

Database Features



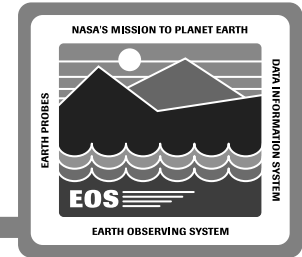
Data Integrity

- **Table-level validation**
 - e.g. integrity constraints, defaults, uniqueness
- **Cross table integrity checks**
 - e.g. referential

Data Security

- **User accounts/privileges**
 - information maintained within the database can be restricted to specific users such as an instrument group
 - provides ability to configure system using a test database without affecting real-time operations
- **Database auditing - logs changes made to the database**

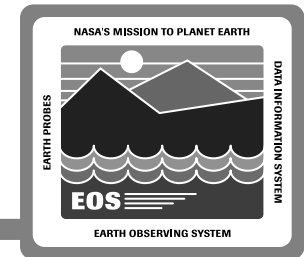
Database Features (cont.)



Data Query

- Able to group data such as parameters by subsystem, sample type, etc.
- Able to access multiple data items with single query
 - e.g. CMS subsystem can receive an expanded activity definition containing the complete command list with their associated constraints by providing DMS just the activity name

Database Query



FOS Database

**Operational
Activity
Tables**

**Operational
Command
Tables**

**Operational
Command
Constraint
Tables**

command list,
parameter list

command
definitions

command
constraint
rules

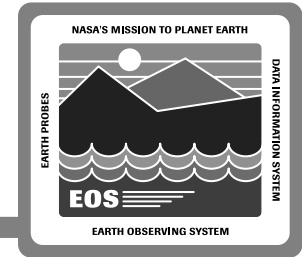
Expanded Activity Definition

Command 1
command def
parameter 1
.
.
parameter n
constraint rule

Command 2
command def
parameter 1

Command n
command def
parameter 1
.
.
parameter n
constraint rule

Database Features (cont.)



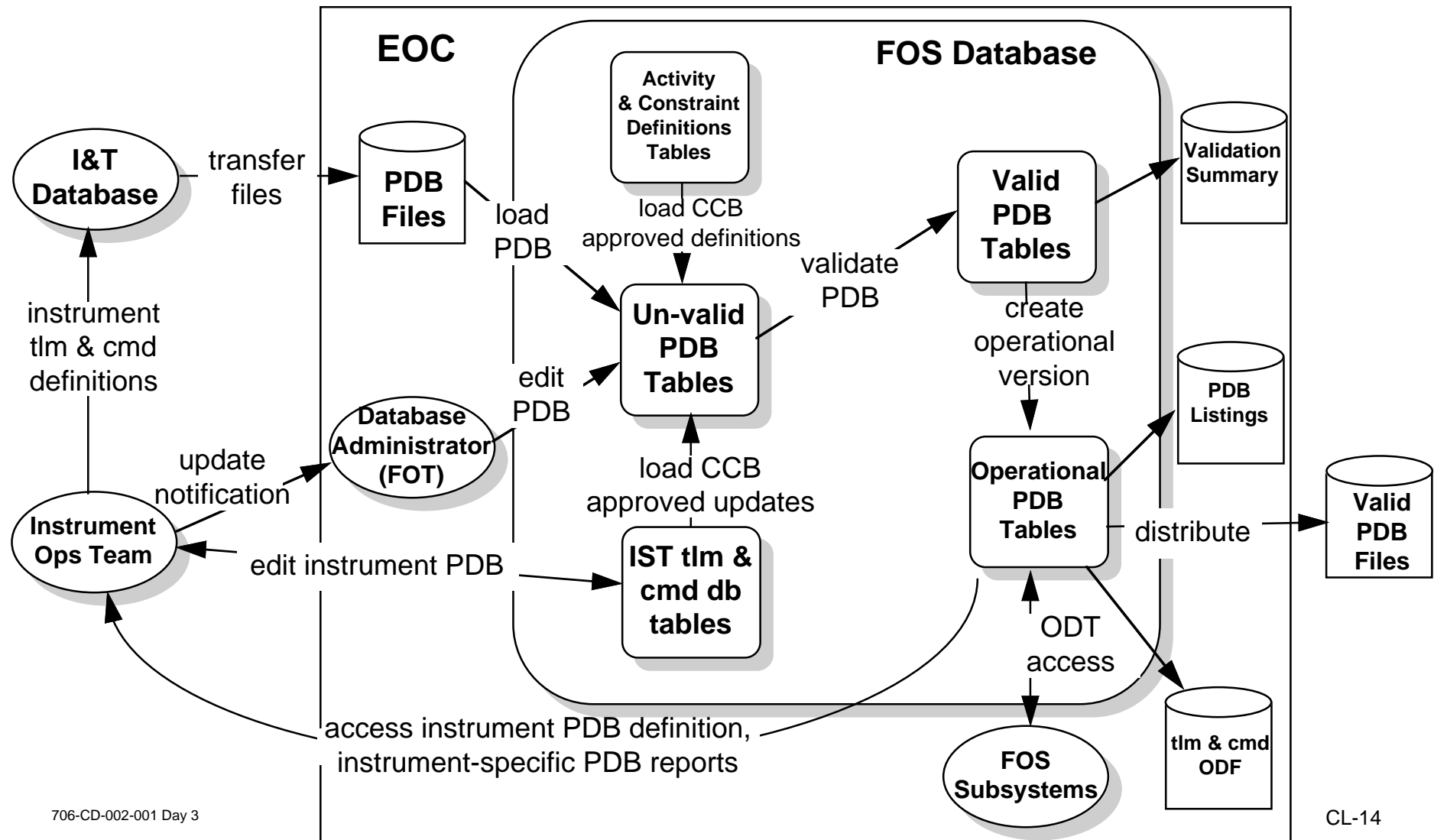
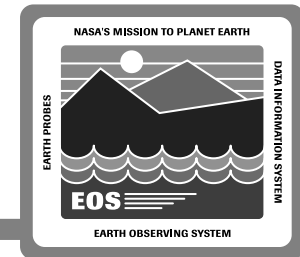
Data Backup and Recovery

- Provides method to recover to point of failure

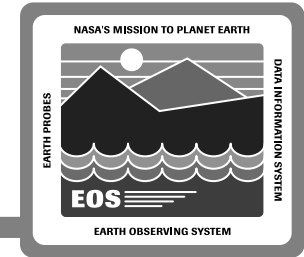
Data Reporting

- SQR workbench
 - Provides report writing language used to create reports from data maintained within the database
 - e.g. PDB listings
 - Allows end users to create reports
 - e.g. instrument-specific PDB report

PDB Processing



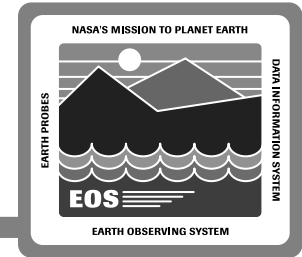
PDB Operational Concept



PDB Overview

- PDB definitions governed by the DFCD for the AM-1 PDB
- PDB processing is administered by the DBA
- Operations CCB
 - Approves modifications to the PDB
 - Accepts new operational version of the PDB

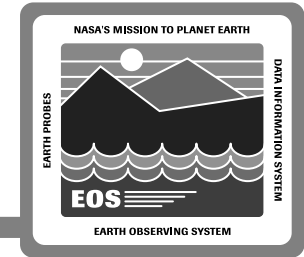
PDB Input



PDB Input

- **Load Telemetry & Command Definitions From the I&T database**
 - Each new release of the I&T database will replace existing definitions in the PDB
 - Designed PDB table definitions with source field to provide method for maintaining modifications made by the FOT
- **Load Operations CCB Approved Activity Definitions**
 - New definitions appended to current activity PDB
 - Designed method for defining and testing activities utilizing a test database
- **Load Operations CCB Approved Instrument Updates From the Instrument Database Tables**
 - Designed interface to the FOS database from an IST

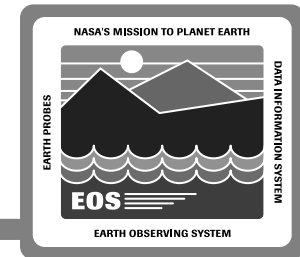
PDB Edit



PDB Edit

- **Accepts definitions needed to support control center activities not provided by the I&T database, such as command-level constraints**
- **Allows modification of PDB definitions from the DBA**
- **Provide the capability for the IOT to make updates to instrument database tables**
 - **Same look and feel as the actual PDB**
 - **Limits access to instrument-specific PDB information**

Telemetry PDB Edit Screen



Telemetry Edit Screen

Telemetry Mnemonic

3565 CDH-VR-GNCB-A5T-2V
3564 CDH-VR-GNCB-A5T-0V
3566 CDH-VR-GNCB-A6T-2V
3567 CDH-VR-GNCB-A6T-0V

PID Parameter Type

Packet ID Packet Offset Parameter Size Telemetry Type

Major Cycle Id Telemetry Instant Delta Time

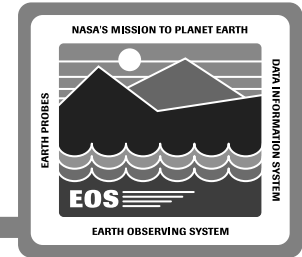
Major Assembly Subassembly

Component Name Remote Terminal ID

Telemetry Description

Search Stop Cancel Commit < > Clear Insert New Record Update Delete

PDB Edit From An IST



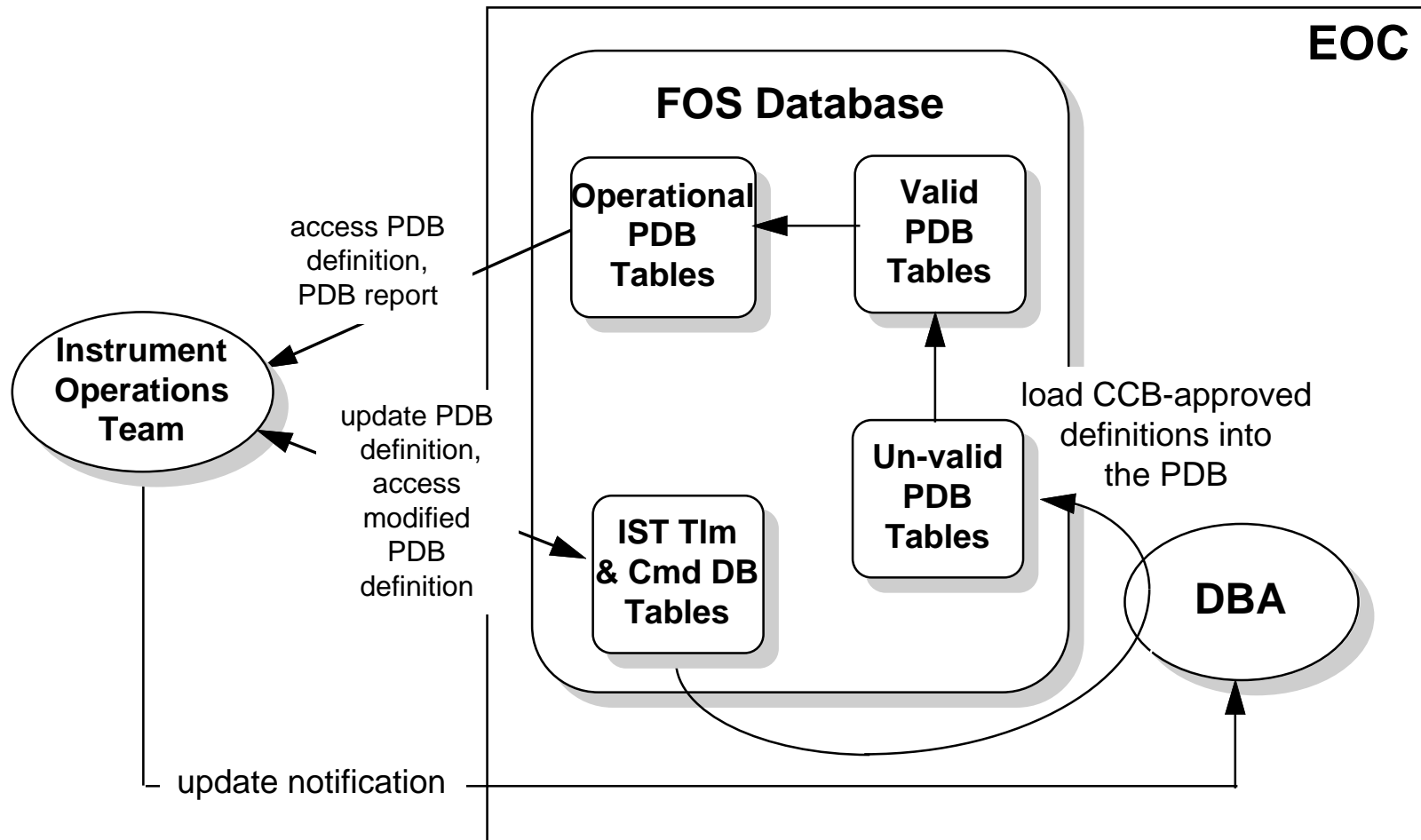
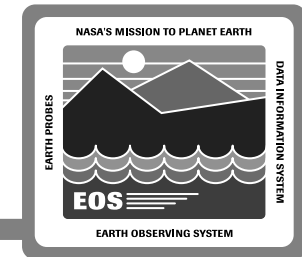
IST User Makes Edit Selection From a Database Menu

**Data Queries Made to Instrument PDB Definitions From the FOS
Operational Data**

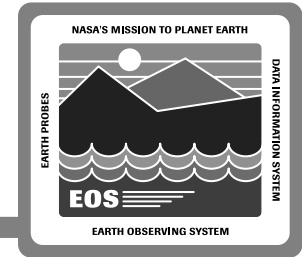
**Configuration Control Managed Through the Use of Temporary Database
Tables**

- **Modification made to temporary tables**
- **Update request made to the DBA at the EOC through E-mail**
- **Once approved, modifications are loaded into the PDB by the DBA**
- **Modified PDB definitions are ready for validation**

PDB Edit From An IST (cont.)



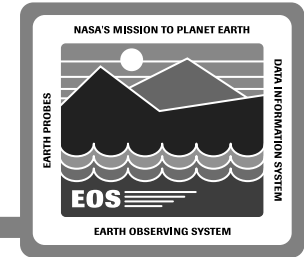
PDB Validation



PDB Validation

- **Verifies contents of the PDB definitions based on the rules specified in the DFCD**
 - **Table-level**
 - **Enforce complex validation rules**
 - **Cross-validate dependent data**
 - **Command-level constraint checking (activity PDB only)**
 - uses the CMS command-level constraint checking process**
- **Ensures integrity through ordered validation process due to data dependencies**
- **Performs complete and partial validation of the PDB**
 - **New release of I&T database required complete validation**
 - **Activities validated independent of other PDB types**
- **Validation summary**

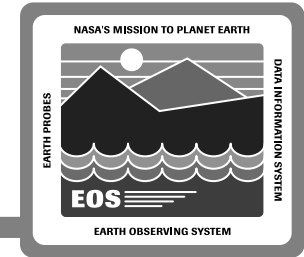
Operational Data Generation



Operational Data Generation

- **Creates telemetry and command operational data files (ODF) to support real-time operations**
- **Creates activities, command and constraint operational data tables (ODT) to support FOS operations**
 - **Accessed through database interface**

PDB Reports



Validation Summary Report

- **Automatically generated during PDB validation**

Complete Listings of the PDB

- **Automatically generated during operational data generation**

PDB Reports by Mnemonic or Type

- **User selected**

Instrument-specific listings

- **IOT selected**